



The X-Bone



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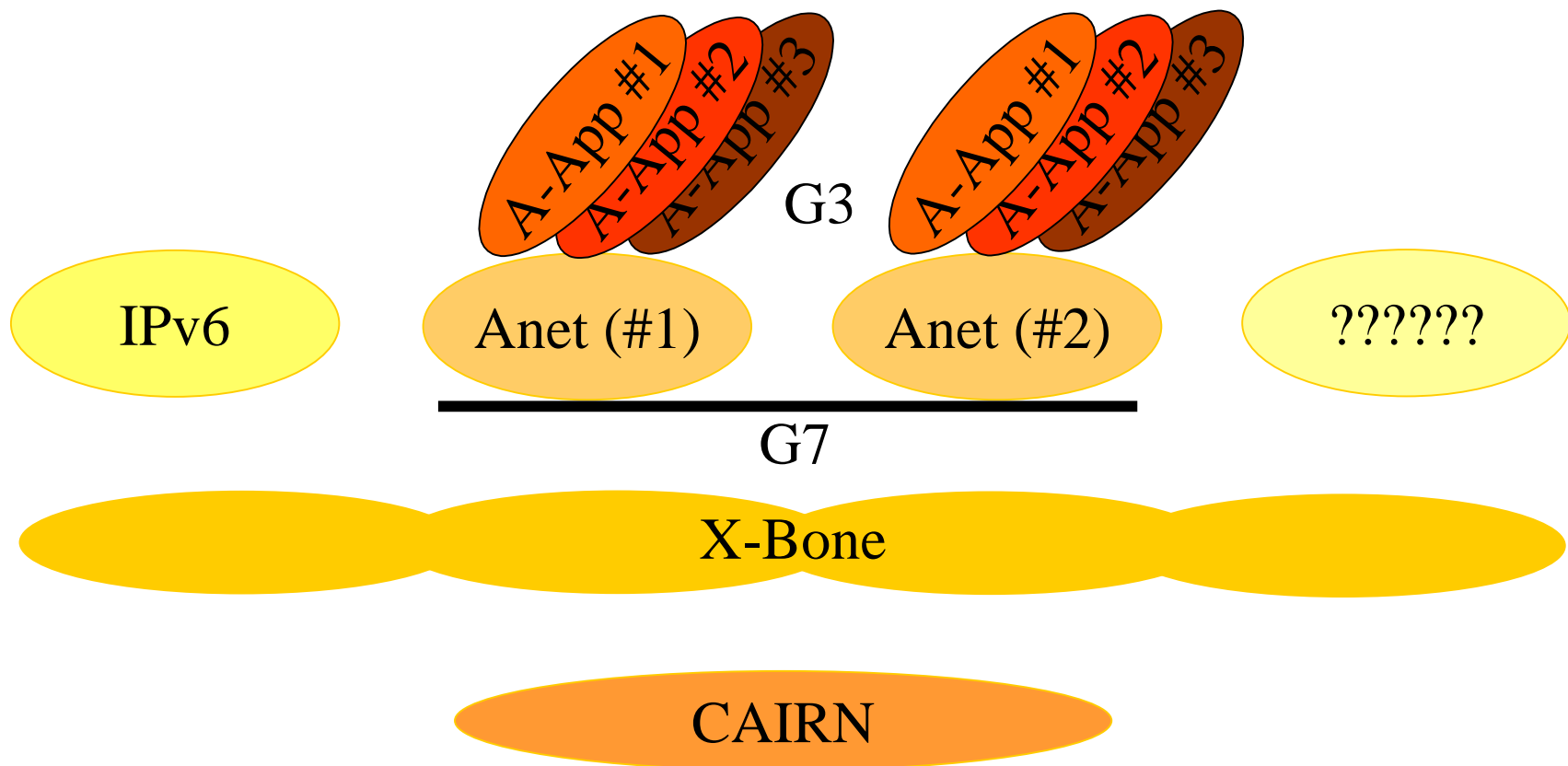


X-Bone Mission

- Virtualize research networks for simultaneous shared but independent use
- Support network research on semi-commodity networks (e.g. CAIRN)



Shared Research Networks





X-Bone and A-Nets

- G7 -- Primary relationship to virtualize CAIRN for A-Net (& other) deployment
- G3 -- Secondary relationship may be to provide API to allow individual A-Net Apps to acquire an overlay network
 - Determine need at G3 level
 - Identify requirements at this level

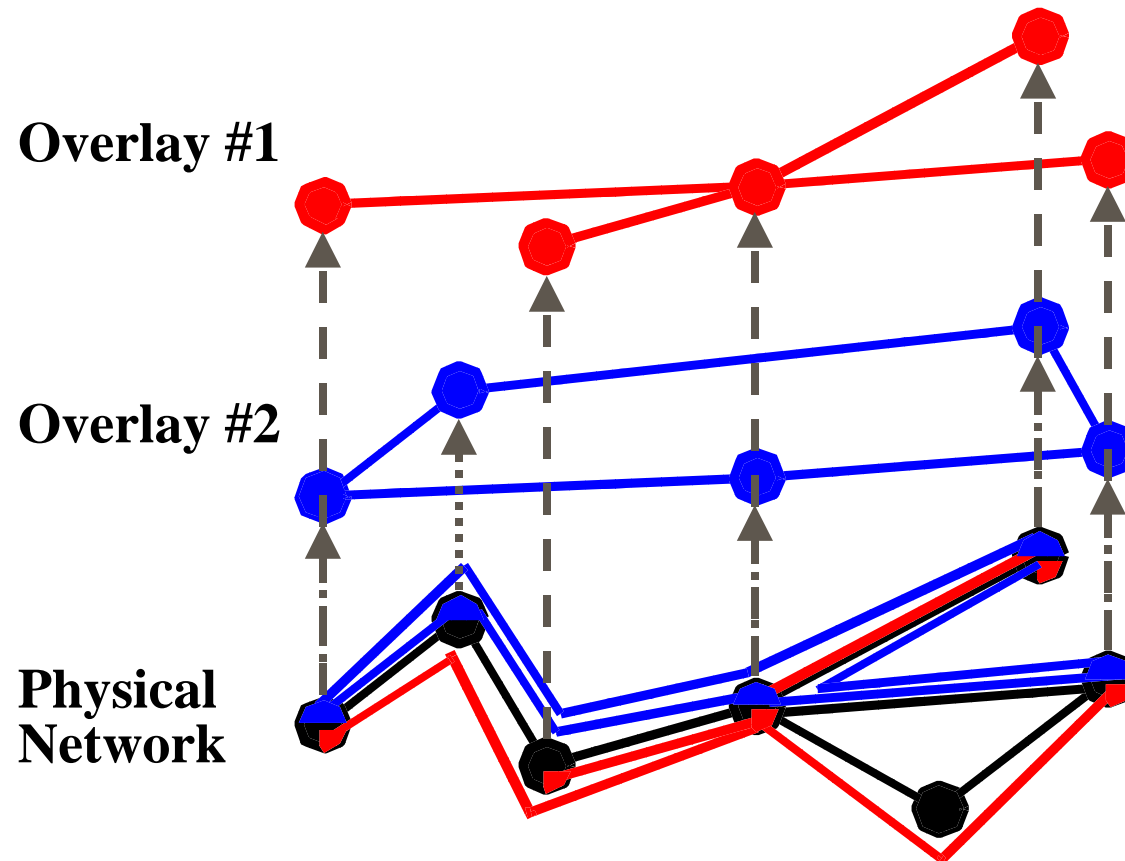


X-Bone Motivation

- Virtual network overlays are useful
 - M-Bone
 - IPv6-Bone
 - ...
- Current deployment is tedious
 - resource discovery: email or phone
 - configuration: by hand

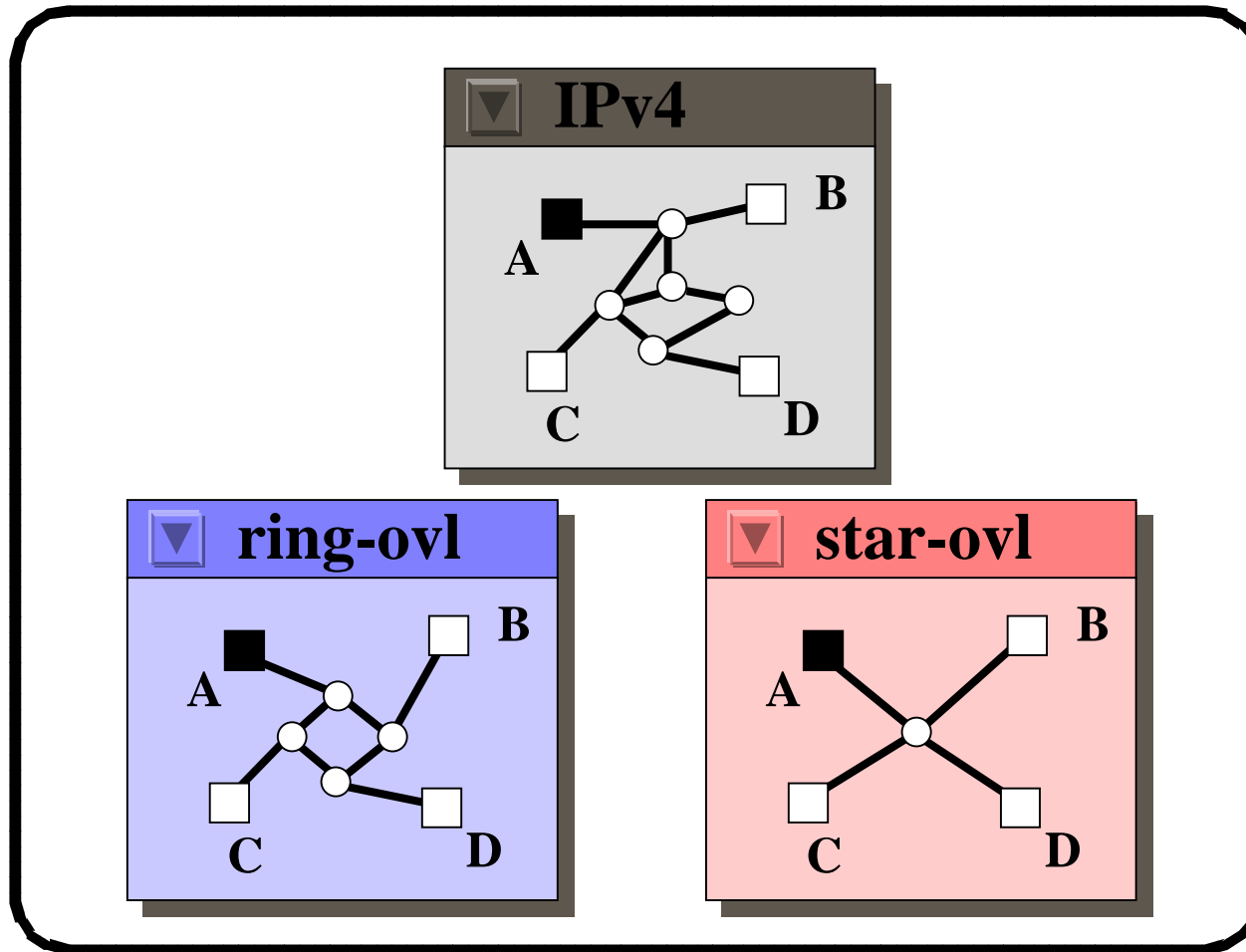


Overlay Networks





Example of X-Bone Use



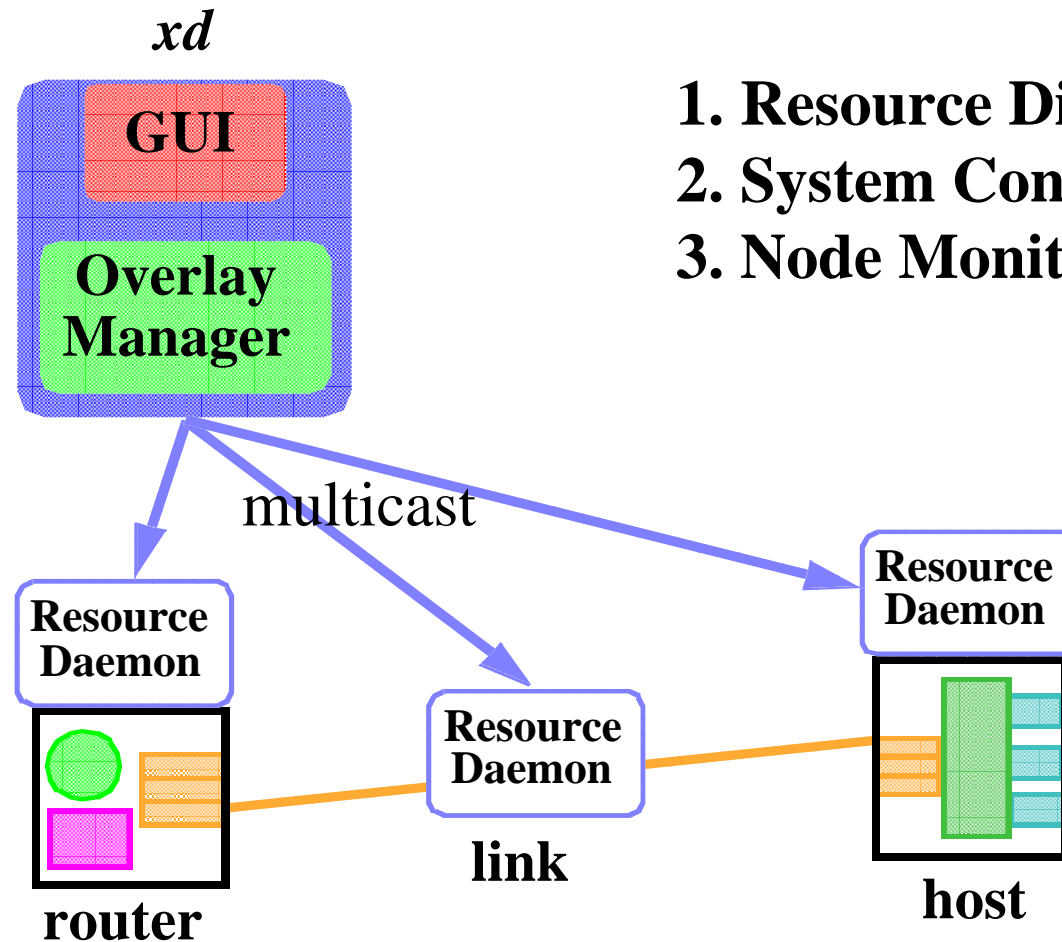


Goals

- Enable rapid, automated deployment
- Coordinate overlay sharing
- Enable three overlay benefits
 - Containment for experiments
 - Reservation for emergency services
 - Simplified view for application networks



X-Bone Architecture



1. Resource Discovery
2. System Configuration
3. Node Monitoring



Approach

- Build command and control infrastructure
 - Leverage & coordinate emerging mechanisms
- Rapid early deployment
 - First demo 5 months from start
- Incremental evolution
 - Emulate capabilities initially (counters)
 - Add capabilities as available (RSVP)
 - Standardize mechanisms (“fill gaps”)



X-Bone Tunnel (the 1st gap)

- Tunnels are well-known mechanism
- Implemented on per-application basis
 - e.g. multicast kernel has tunnels
- No generic tunnel to “turn on”
- `xb_tunnel`
 - built on available OS hooks



Issues

- Resource policy
 - Sharing groups, fairness, enforcement
- Monitoring
 - Check state, act on anomalies
- Integrated security
- Recursion
 - Overlays on overlays
- Optimization



Release Schedule

- Alpha demo Q4 1998
 - basic GUI, star networks only, single key PGP
- Beta to be released Q2 1999
 - adds ring, multi-key PGP, simple monitoring
- Ongoing releases every 6 months
 - IPSEC, TMP, RSVP++, SNMP++
- More info at: <http://www.isi.edu/x-bone/>